Tennessee

Gateway Assessment
Item Sampler

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Contents

Introduction to Gateway Science

Content of Tests

The testing program titled the *Tennessee Gateway Assessment* was established to meet the Tennessee mandate for high stakes, end-of-course assessments in Tennessee secondary schools. These tests measure the Tennessee Performance Indicators. Subject areas covered by the testing program include Mathematics, Language Arts, and Science.

Test Development

For the *Tennessee Gateway Assessment*, a staff of writers—composed of both Tennessee teachers and professional test developers experienced in each of the content areas—researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test Administration

Tennessee Gateway Assessment tests are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

Each test contains 62 multiple-choice questions.

Students will have ample time to read and answer each of the questions. Each test has been designed to be administered in one session. The first 15 minutes are set aside to complete identifying data on the answer sheet, and the last 5 minutes are set aside to complete the Opportunity to Learn Survey.

Tips for Students Taking the Test

Preparing for the test

- Review this Tennessee Gateway Item Sampler for Science carefully and thoroughly.
- Acquire a Tennessee Gateway Practice Test for Science, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in the Practice Test.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. Answer all questions you are sure of first.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Science provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given Gateway test administration. Performance Indicators have been grouped under Reporting Categories. These Reporting Categories will be used to report information regarding performance on the Gateway tests to students, teachers, schools, and systems.

The items in this Item Sampler will **not** be found in the Gateway tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the Gateway Assessment Practice Test for Science should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

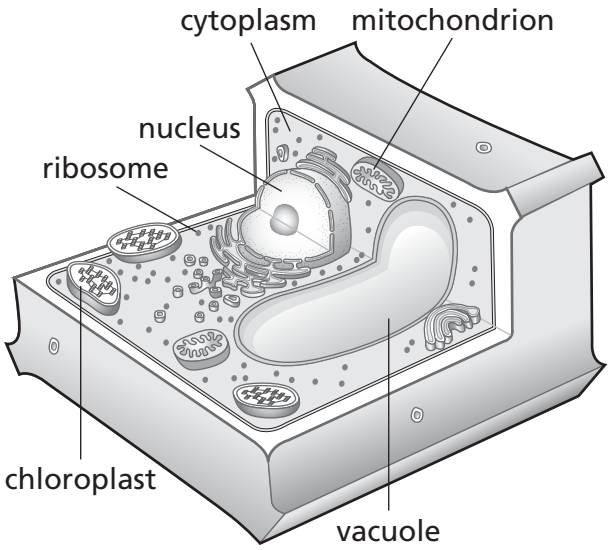
An Answer Key is located on page 57. Use it to check your answers. Review items that you get wrong.

Reporting Category: 1. Cell Organelles and Biomolecules

Performance Indicator: Identify major cell organelles, given a diagram.

Number 1

Directions Use the diagram of the plant cell below to answer Number 1.



1 **Food, water, and cellular wastes are stored primarily in the**

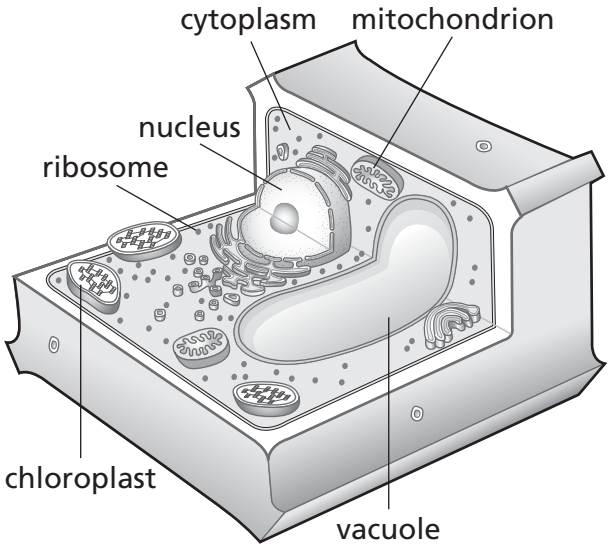
A nucleus
B vacuole
C chloroplasts
D mitochondria

Reporting Category: 1. Cell Organelles and Biomolecules

Performance Indicator: Distinguish between plant and animal cells given diagrams or scenarios.

Numbers 2 and 3

Directions Use the diagram of the plant cell below to answer Number 2.



2 Which of these features would <u>not</u> be found in an animal cell?

F the nucleus
G chloroplasts
H the cytoplasm
J mitochondria

Reporting Category: 1. Cell Organelles and Biomolecules

Performance Indicator: Distinguish between plant and animal cells given diagrams or scenarios.

Numbers 2 and 3

3 **In a biology class, students were asked to use a microscope to distinguish between plant and animal cells. A student noticed a difference between the vacuoles in plant and animal cells.**

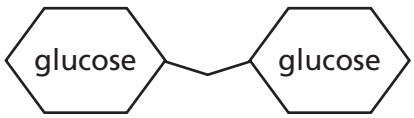
How do the vacuoles in plant cells differ from animal cell vacuoles?

A Plant cell vacuoles are usually larger.
B Plant cell vacuoles are usually smaller.
C Plant cells rarely contain vacuoles.
D Plant cells usually contain more vacuoles.

Performance Indicator: Distinguish proteins, carbohydrates, lipids, and nucleic acids, given structural diagrams.

Number 4

4 **The basic structure of an organic molecule is shown below.**



What type of molecule is this?

F a lipid
G a protein
H a nucleic acid
J a carbohydrate

Reporting Category: 1. Cell Organelles and Biomolecules

Performance Indicator: Identify a positive test for carbohydrates and lipids when given an experimental procedure, data, and results.

Numbers 5 and 6

5 When a student added iodine to an unknown solution, the solution turned a dark color. This color change indicated that the solution contained

A lipids
B proteins
C DNA
D starch

6 In a laboratory experiment students tested four unknown samples for three properties. The results are shown in the table below.

PROPERTIES OF UNKNOWN SAMPLES

Sample	Mixes with water	Stains dark with iodine	Leaves translucent spot on brown paper
1	Yes	Yes	No
2	No	No	No
3	No	No	Yes
4	Yes	Yes	No

Which sample most likely contains a lipid?

F Sample 1
G Sample 2
H Sample 3
J Sample 4

Reporting Category: 1. Cell Organelles and Biomolecules

Performance Indicator: Identify the biomolecules responsible for communicating, responding, regulating, or reproducing in the cell.

Number 7

7 **Which of these molecules provides the information necessary for cells to be able to reproduce accurately by mitosis?**

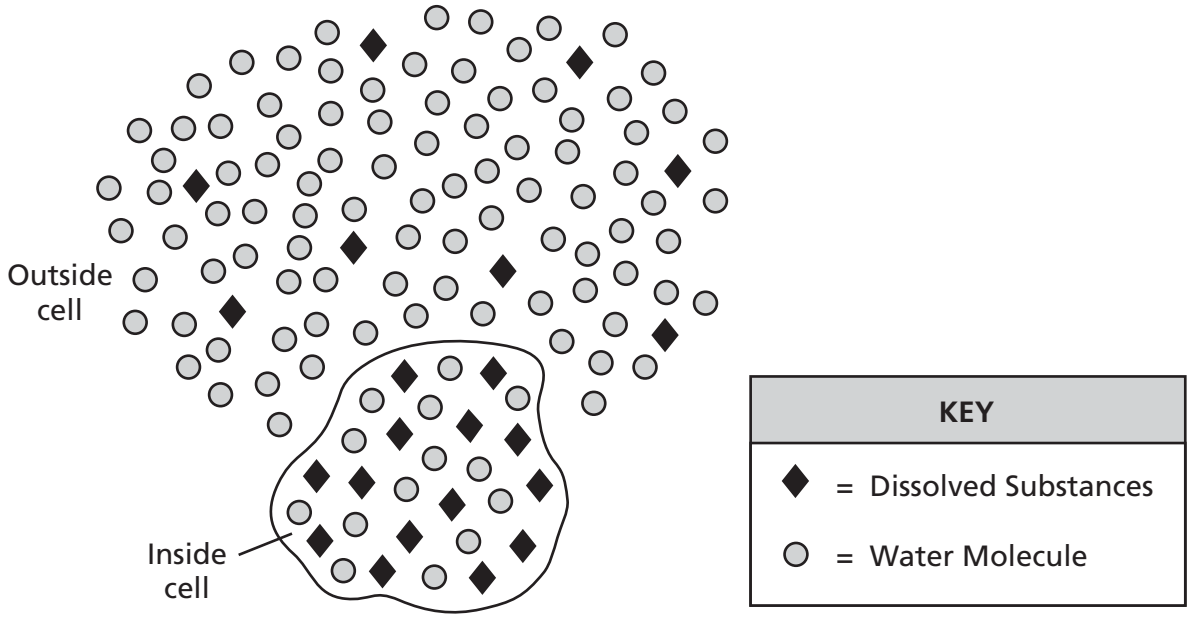
A ATP
B DNA
C lipids
D carbohydrates

Reporting Category: 2. Cell Processes

Performance Indicator: Predict the movement of water molecules across the cell membrane, given solutions of different concentrations.

Numbers 8 and 9

8 **A cell was just placed in a new environment. The diagram below shows the concentration of dissolved substances inside this cell and in its new environment. The cell membrane is not permeable to these dissolved substances.**



Which of these statements best describes what will immediately happen to the cell in its new environment?

F Water will move into the cell.

G Water will move out of the cell.

H None of the water or dissolved substances will move into or out of the cell.

J The dissolved substances will move into the cell while water moves out of the cell.

9 **Which of these results is most likely to occur when a plant cell is placed in pure water?**

A More water will enter the cell than leave the cell.

B More water will leave the cell than enter the cell.

C Water will enter and leave the cell at the same rate.

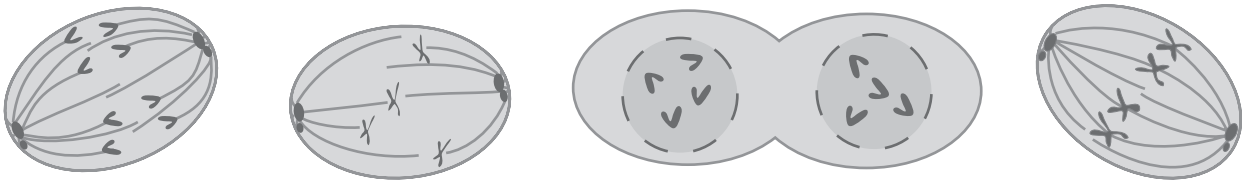
D Water will only enter the cell; no water will leave the cell.

Reporting Category: 2. Cell Processes

Performance Indicator: Sequence a series of diagrams depicting the movement of chromosomes during mitosis.

Numbers 10 and 11

Directions The figures below show the four stages of mitosis for an animal cell, but the stages are out of order. Use the diagram to answer Numbers 10 and 11.



1 2 3 4

10 What is the correct order of the stages of mitosis shown above?

F 1 – 4 – 3 – 2
G 2 – 4 – 1 – 3
H 4 – 1 – 2 – 3
J 4 – 2 – 1 – 3

11 Which figure shows the last stage of mitosis?

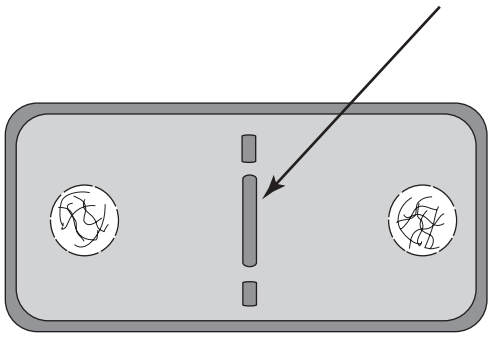
A Figure 1
B Figure 2
C Figure 3
D Figure 4

Reporting Category: 2. Cell Processes

Performance Indicator: Compare and contrast the cell cycle in plant and animal cells, given a diagram or description.

Number 12

12 **The plant cell below contains two nuclei and is about to complete its division into two separate cells.**



The arrow is pointing to a structure in the middle of the parent cell. What is this structure?

F a centriole

G a cell plate

H a chromosome

J a cleavage furrow

Reporting Category: 2. Cell Processes

Performance Indicator: Distinguish between active and passive transport, given examples of different molecules.

Number 13

13 **Cells require oxygen for a variety of processes. Oxygen passes through the cell membrane, moving from areas of high concentration to areas of lower concentration.**

What process is illustrated by this movement of oxygen?

A osmosis
B cytokinesis
C active transport
D passive transport

Performance Indicator: Evaluate the role of meiosis in maintaining genetic variability and continuity, given a scenario.

Numbers 14 and 15

14 **A certain type of organism can be either black or white. Which of these processes makes it possible for two of these organisms to produce both black offspring and white offspring?**

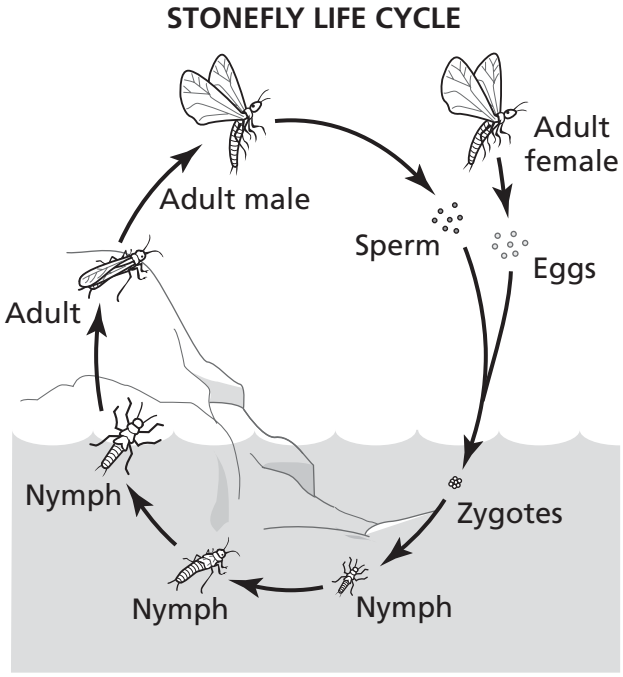
F meiosis
G mitosis
H convergent evolution
J complete metamorphosis

Reporting Category: 2. Cell Processes

Performance Indicator: Evaluate the role of meiosis in maintaining genetic variability and continuity, given a scenario.

Numbers 14 and 15

15 **The life cycle of a stonefly is shown in the diagram below.**



When a pair of stoneflies reproduce, their offspring may vary in color and in a number of other traits. Which of these processes contributes to variation among stonefly offspring?

A meiosis
B metamorphosis
C aerobic respiration
D alternation of generations

Reporting Category: 2. Cell Processes

Performance Indicator: Determine the number of chromosomes following mitosis or meiosis, given the number of chromosomes in the original cell.

Number 16

16 **Opossums have 22 chromosomes in each of their skin cells. How many chromosomes are in an opossum's sex cell?**

F 11
G 22
H 44
J 88

Performance Indicator: Recognize the significance of homeostasis to the viability of humans and other organisms, given the definition of homeostasis.

Number 17

17 **Homeostasis is the process by which an organism maintains a relatively stable internal environment.**

Under certain conditions mammals such as dogs and humans will often shiver. What is the primary benefit of shivering?

A It increases blood pressure.
B It decreases the breathing rate.
C It decreases heat loss.
D It increases the internal body temperature.

Reporting Category: 3. Interactions: Between Organisms and Behavior

Performance Indicator: Identify commensalism, parasitism, and mutualism, given a scenario with examples.

Number 18

18 **Corals get about 90% of their food from algae that live inside the corals' tissues. The algae provide carbohydrates for the corals and the corals provide shelter and nitrogen for the algae.**

According to this information, the relationship between the coral and the algae is an example of

F predation
G mutualism
H parasitism
J commensalism

Performance Indicator: Classify organisms as producers, consumers, or decomposers, given their behaviors and environment.

Number 19

19 **Crayfish are found in many freshwater communities in North America. Crayfish find shelter under rocks, in vegetation, or in bottom sediment. Crayfish prey on insects and snails but will sometimes eat plants and algae.**

Which of these best describes the role of crayfish?

A parasite
B consumer
C decomposer
D producer

Reporting Category: 3. Interactions: Between Organisms and Behavior

Performance Indicator: Identify abiotic and biotic factors, given a description or an illustration of an ecosystem.

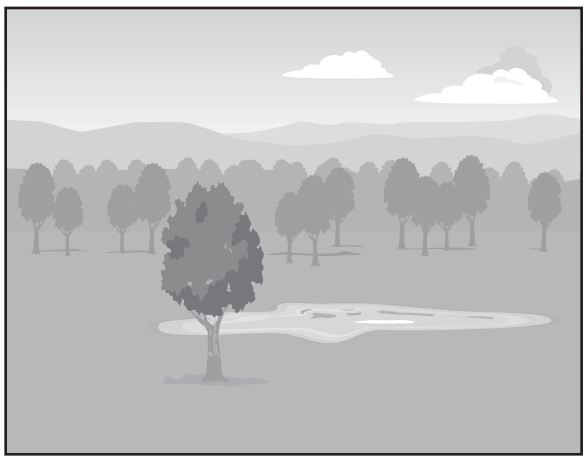
Numbers 20 and 21

20 **While exploring a cave, a group of scientists encountered many *abiotic* and *biotic* factors.**

Which of the following factors is *biotic*?

F bacteria
G limestone
H minerals
J waterfall

21 **The diagram below shows a meadow in the Appalachian Mountains.**



Which of these is an *abiotic* factor in the meadow ecosystem?

A grass
B water
C trees
D mosquitoes

Reporting Category: 3. Interactions: Between Organisms and Behavior

Performance Indicator: Distinguish between a learned or an innate behavior, given a description of that behavior in a scenario.

Number 22

22 **In an experiment, a scientist raised a spider in an enclosure with no other spiders. The spider spun a web similar to webs spun by other members of its species. The spider's ability to spin a web is an example of**

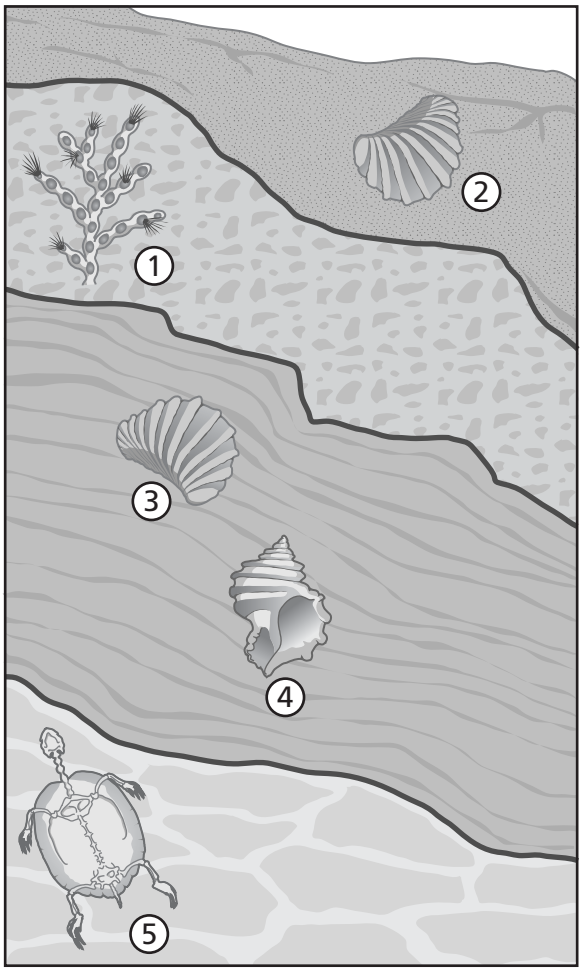
F mimicry
G camouflage
H innate behavior
J learned behavior

Reporting Category: 3. Interactions: Between Organisms and Behavior

Performance Indicator: Differentiate between the relative age of various fossils in sedimentary rock, given a diagram of rock strata.

Number 23

23 **The diagram below shows several rock layers and fossils.**



According to this diagram, which statement is not true about the fossils in the rock layers?

A Fossil 1 is the youngest fossil.

B Fossil 5 is the oldest fossil.

C Fossil 3 is older than fossil 1.

D Fossil 4 is older than fossil 2.

Reporting Category: 4. Interactions: Population Dynamics and Energy Flow

Performance Indicator: Make inferences about how environmental factors would affect population growth, given a scenario.

Number 24

24 **The diagram below shows a food chain.**

green plants → field mice → barn owls

Based on this food chain, several years with below average rainfall will most likely lead to

F an increase in the population of field mice

G an increase in the number of field mice each owl must eat to survive

H a decrease in the population of barn owls

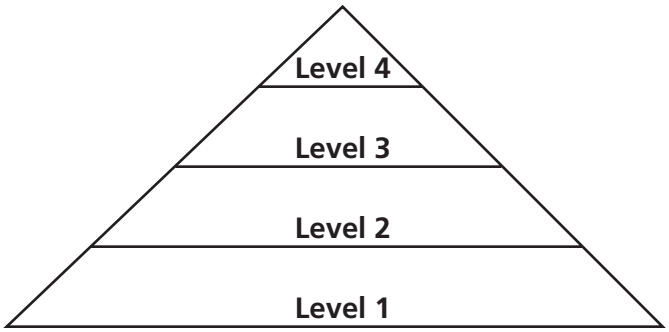
J a decrease in the number of field mice each owl must eat to survive

Reporting Category: 4. Interactions: Population Dynamics and Energy Flow

Performance Indicator: Examine the energy flow and loss through the trophic levels of an ecosystem, given an illustration of an energy pyramid.

Number 25

25 **The diagram below shows a simplified energy pyramid for an ecosystem.**



Which statement is true about the flow of energy through the energy pyramid?

A Energy moves from Levels 3 and 4 to Levels 1 and 2.

B The amount of energy increases as it moves from Level 1 to Level 4.

C There is little loss of energy as it moves from one trophic level to another.

D The amount of energy decreases as it moves upward through the trophic levels.

Reporting Category: 4. Interactions: Population Dynamics and Energy Flow

Performance Indicator: Determine the effects of human activities on ecosystems, given a scenario.

Numbers 26 and 27

26 **Food crops are often sprayed with pesticides. Birds and small mammals eat the seeds of these crops and the pesticides are deposited in their tissues.**

When predators eat these birds and small mammals, the pesticides

F are effectively removed from the food chain
G increase in concentration as they move up the food chain
H decrease in concentration as they move up the food chain
J remain at the same concentration as they move up the food chain

27 **The food chain below contains some organisms found in a pond ecosystem.**

algae → zooplankton → insects → bluegill → bass

According to the food chain, which of these would most likely happen if people caught and ate most of the bass?

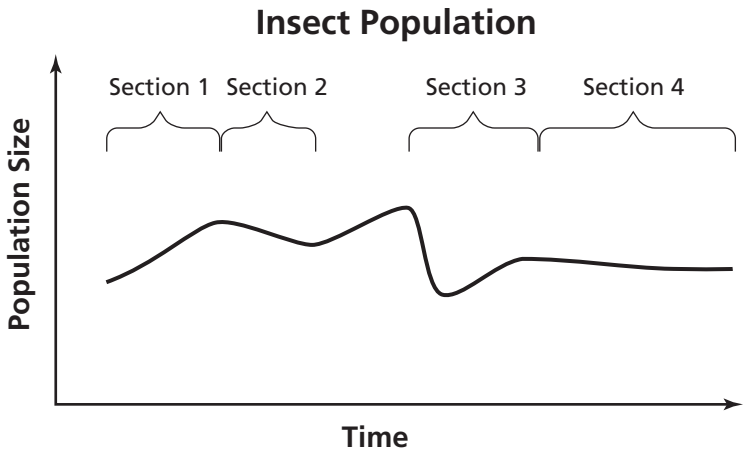
A The insect populations would increase.
B The bluegill population would decrease.
C The algae, zooplankton, insect, and bluegill populations would all be affected.
D The bluegill population would increase, but the other organisms would not be affected.

Reporting Category: 4. Interactions: Population Dynamics and Energy Flow

Performance Indicator: Analyze and interpret population growth curves, given graphs.

Number 28

28 **The graph below shows the size of an insect population over time.**



In which section of the graph did the most change in the size of the insect population occur in the least amount of time?

F Section 1

G Section 2

H Section 3

J Section 4

Reporting Category: 4. Interactions: Population Dynamics and Energy Flow

Performance Indicator: Predict how environmental changes will encourage or discourage the formation of a new species or extinction of an existing species, given a written scenario.

Number 29

29 **A certain species of plant is only pollinated by one species of moth. The plant serves as the only food for the larvae of this moth. Over a period of several years, a disease killed all of the plant population.**

As a result of the plant disease, which of these scenarios is most likely to occur in the moth population?

A The moth population will eventually become extinct.
B The moth larvae will quickly adapt to eat other plants.
C The moth population will evolve to form a new species.
D The moth larvae will try to enter the adult stage more quickly.

Performance Indicator: Differentiate between natural selection and selective breeding, given a scenario.

Number 30

30 **The ancestors of the giant panda had rounded paws with five very short toes. The giant panda has a sixth digit often referred to as a "thumb." This "thumb" allows the panda to pluck, hold, and eat bamboo shoots.**

The presence of this "thumb" on the paws of giant pandas is most likely the result of

F mitosis
G succession
H natural selection
J selective breeding

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Identify the reactants and products of photosynthesis and respiration, given the equations.

Number 31

31 **Two cellular processes are shown below.**

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy}$$

$$6CO_2 + 6H_2O + \text{Energy} \longrightarrow C_6H_{12}O_6 + 6O_2$$

One of the equations represents respiration. During respiration, the reactants are converted into

A Energy and O_2

B $C_6H_{12}O_6$ and O_2

C $C_6H_{12}O_2$ and H_2O

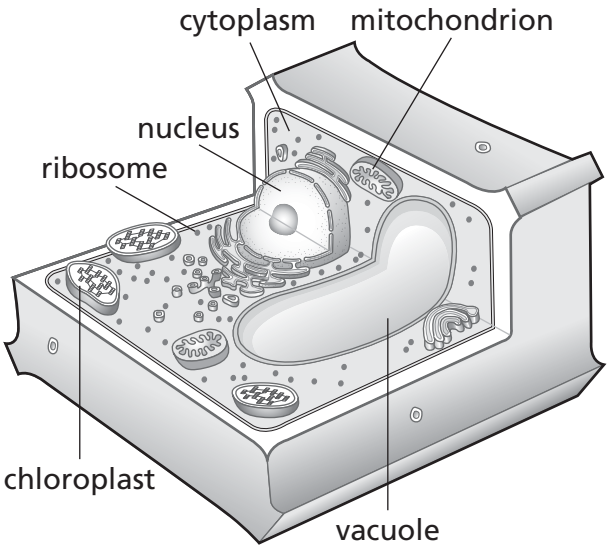
D Energy, H_2O and CO_2

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Identify the cell organelle in which photosynthesis occurs, given a diagram of a plant.

Number 32

Directions Use the diagram of the plant cell below to answer Number 32.



32 **Which organelle makes food?**

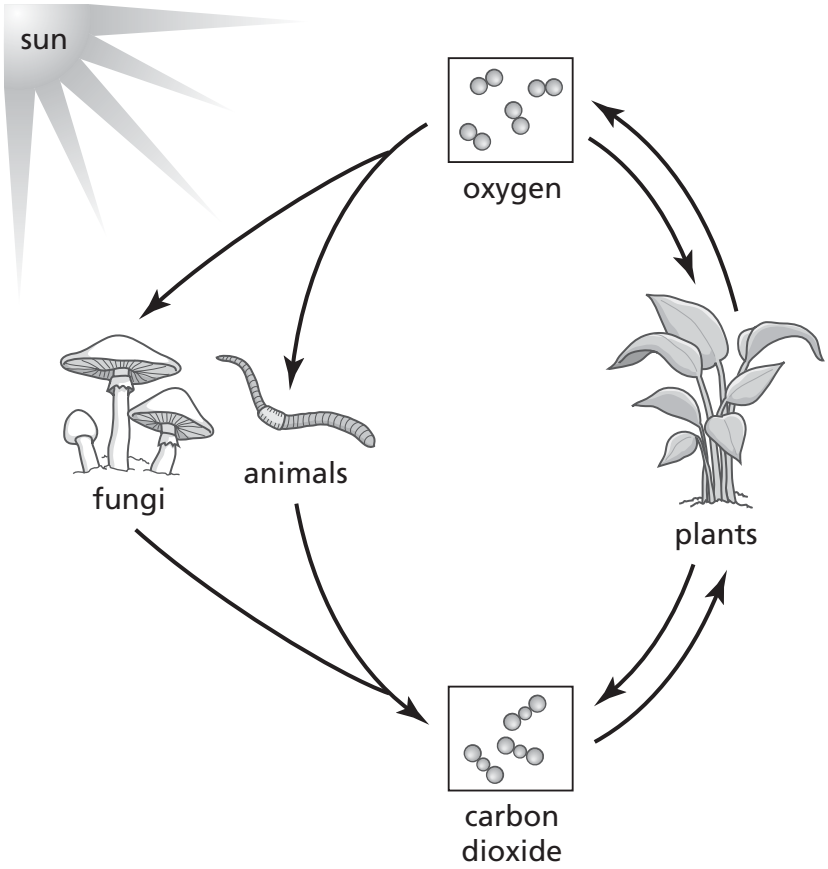
F the chloroplast
G the ribosome
H the vacuole
J the nucleus

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Interpret a diagram of the oxygen-carbon dioxide cycle, given a diagram.

Number 33

33 **The diagram below shows the flow of oxygen and carbon dioxide in an ecosystem.**



Carbon dioxide is used by

A animals during respiration
B animals, plants, and fungi during respiration
C plants during photosynthesis
D plants and fungi during photosynthesis

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Distinguish between aerobic and anaerobic respiration in terms of the presence or absence of oxygen and ATP produced.

Numbers 34 and 35

34 **When Alex runs very fast, his muscle tissues use oxygen faster than it can be supplied. When this happens, pyruvic acid is broken down into lactic acid to provide energy for muscle activity.**

Which of these processes is responsible for producing lactic acid in muscles?

F osmosis
G chemosynthesis
H aerobic respiration
J anaerobic respiration

35 **The table below shows some requirements and products of two types of cellular respiration.**

Process	Requires oxygen?	Amount of ATP produced
1	No	Low
2	Yes	High

Which statement correctly identifies the types of respiration in the table above?

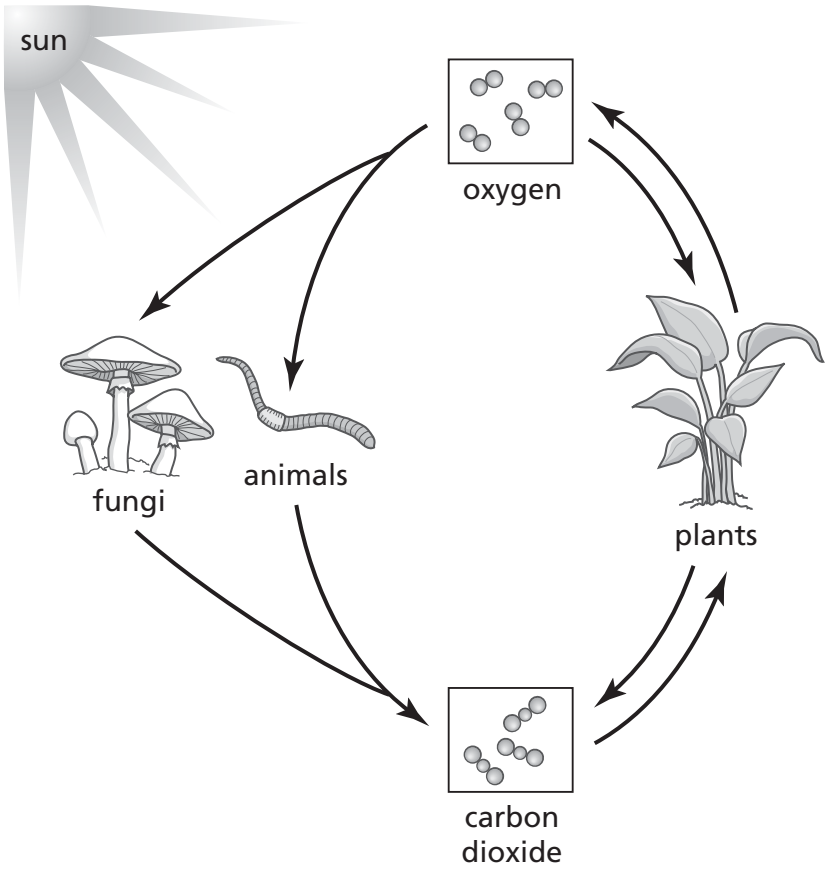
A Processes 1 and 2 are two different types of aerobic respiration.
B Processes 1 and 2 are two different types of anaerobic respiration.
C Process 1 is anaerobic respiration and Process 2 is aerobic respiration.
D Process 1 is aerobic respiration and Process 2 is anaerobic respiration.

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Relate the interdependence of the processes of photosynthesis and respiration to living organisms, given a diagram or a description.

Numbers 36 and 37

36 The diagram below shows the flow of carbon dioxide and oxygen in an ecosystem.



Plants produce oxygen which is used by fungi, animals, and plants. In what process do these organisms use oxygen?

F mitosis
G replication
H respiration
J photosynthesis

Reporting Category: 5. Photosynthesis and Respiration

Performance Indicator: Relate the interdependence of the processes of photosynthesis and respiration to living organisms, given a diagram or a description.

Numbers 36 and 37

37 **Plants and animals exchange materials through the processes of photosynthesis and respiration. Which statement is true about the way these two processes are related?**

A The products of photosynthesis inhibit respiration.

B The products of photosynthesis are also the products of respiration.

C The reactants of photosynthesis are also the reactants of respiration.

D The products of photosynthesis are the reactants of respiration.

Performance Indicator: Recognize the transfer of energy from respiration to cellular work, given an equation or diagram of the ATP cycle.

Number 38

38 **Cells that line the human stomach contain hydrogen ion pumps in their cell membranes. These pumps allow the cells to move hydrogen from areas of low concentration inside the cells to areas of higher concentration outside the cells.**

Which equation best represents the reaction that makes the movement of hydrogen ions possible?

F $ATP \rightarrow ADP + P + energy$

G $ATP + P + energy \rightarrow ADP$

H $O_2 + H_2O + energy \rightarrow ATP + CO_2$

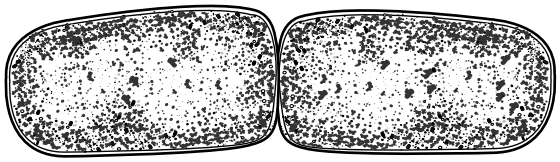
J $ATP + CO_2 \rightarrow O_2 + H_2O + energy$

Reporting Category: 6. Genetics

Performance Indicator: Distinguish between asexual and sexual methods of reproduction, using a scenario.

Number 39

39 **The figure below shows two new cells forming from a single bacterial cell.**



What is this process called?

A mutation
B translation
C sexual reproduction
D asexual reproduction

Reporting Category: 6. Genetics

Performance Indicator: Identify the dominant trait, given the results of a monohybrid cross in a scenario.

Number 40

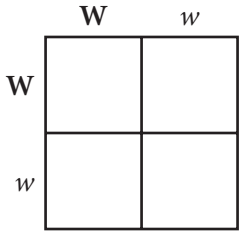
40 **A gardener crossed two purple flowers and discovered that 76% of the offspring had purple flowers while 24% had red flowers. According to these results, the allele for red flower color is most likely**

F codominant
G dominant
H recessive
J sex-linked

Performance Indicator: Determine the genotype and phenotype of a monohybrid cross, given a Punnett square.

Number 41

41 **In some types of dogs, the allele for wire hair (W) is dominant to the allele for smooth hair (*w*). A dog breeder mated two dogs. The Punnett square below shows the alleles for the two dogs the breeder mated.**



What is the probability that a dog with wire hair will be produced in this litter?

A 25%
B 50%
C 75%
D 100%

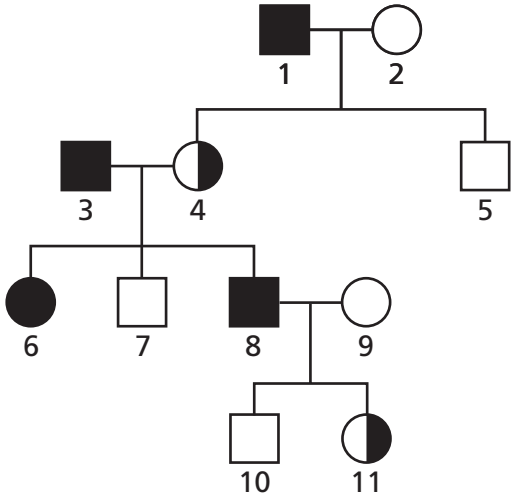
Reporting Category: 6. Genetics

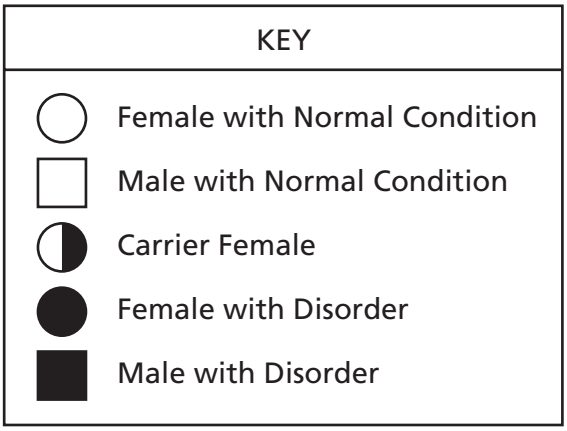
Performance Indicator: Identify the sex chromosomes in humans and recognize inheritance patterns that are sex-linked, using a pedigree.

Numbers 42 and 43

Directions Use the information below to answer Numbers 42 and 43.

42 The pedigree below shows the occurrence of a certain genetic disorder in four generations of a human family.





What is the pattern of inheritance of the disorder in this pedigree?

F dominant
G sex-linked
H co-dominant
J incomplete dominance

Reporting Category: 6. Genetics

Performance Indicator: Identify the sex chromosomes in humans and recognize inheritance patterns that are sex-linked, using a pedigree.

Numbers 42 and 43

43 **The disorder in the pedigree is caused by a recessive allele (X^d) while the allele for the normal condition (X^D) is dominant.**

Based on the diagram, which individual in this pedigree has the genotype X^DX^d?

A Individual 2

B Individual 3

C Individual 4

D Individual 6

Reporting Category: 6. Genetics

Performance Indicator: Analyze modes of inheritance including codominance, incomplete dominance, polygenic, and multiple alleles using genetic problems or Punnett squares.

Numbers 44 and 45

44 **The four possible blood types for humans are A, B, AB, and O. Type A blood in humans is codominant with type B blood. Type O blood is recessive to blood types A and B. The genotype of a person with type A blood can be either AA or AO, and the genotype of a person with type B blood can be either BB or BO.**

A man with type A blood and a woman with type B blood have a child with type O blood.

What are the genotypes of this man and woman?

F AO and BB

G AA and BO

H AO and BO

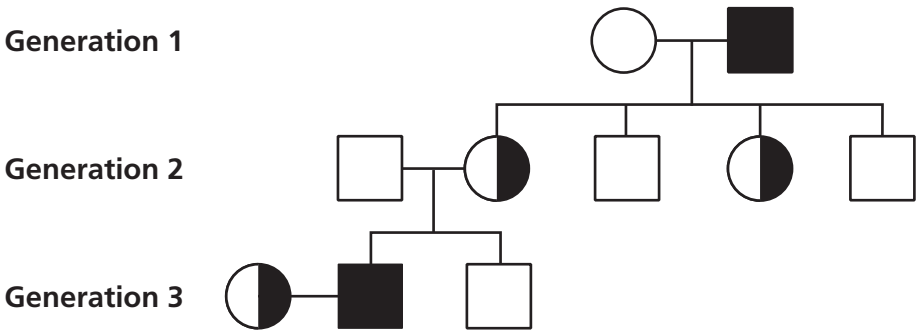
J AA and BB

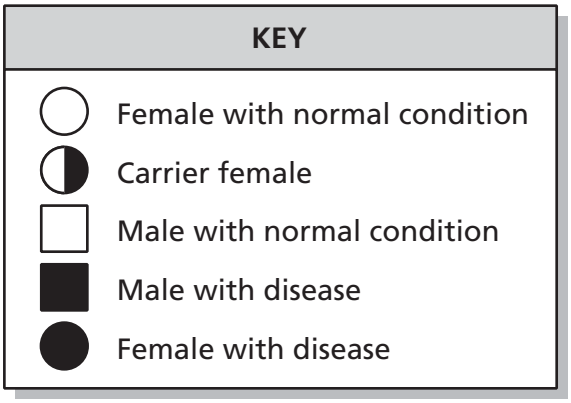
Reporting Category: 6. Genetics

Performance Indicator: Analyze modes of inheritance including codominance, incomplete dominance, polygenic, and multiple alleles using genetic problems or Punnett squares.

Numbers 44 and 45

45 The inheritance pattern for a human genetic disease is shown in the pedigree below.





In Generation 3 the male who has the disease is married to a woman who is a carrier. If the couple has a daughter, what is the probability she will inherit the disease?

A 25%
B 50%
C 75%
D 100%

Reporting Category: 6. Genetics

Performance Indicator: Determine the probability of having a child with cystic fibrosis, sickle cell anemia, or Tay-Sachs if both parents are carriers, given a scenario or genetic problem.

Numbers 46 and 47

46 A man and a woman are considering having a child. Genetic testing reveals that both parents are carriers for Tay-Sachs.

What is the probability that the couple will have a child that does not have Tay-Sachs?

F 25%
G 50%
H 75%
J 100%

47 A married couple wants to have a child. One of the parents has cystic fibrosis, a disease caused by recessive alleles. The other parent does not have the recessive allele. What is the chance that the couple will have a child with cystic fibrosis?

A 0%
B 50%
C 75%
D 100%

Reporting Category: 6. Genetics

Performance Indicator: Analyze a dihybrid cross given a completed Punnett square to determine the probability of a particular trait.

Number 48

48 **The presence of the Rh factor in blood and the ability to produce skin pigment are two genetically inherited traits that occur on separate chromosomes in humans. The allele for having the Rh factor (R) is dominant to the allele for not having the Rh factor (r). The allele for producing skin pigment (P) is dominant to the allele for not producing pigment (*p*). The Punnett square below shows the genotypes of a man and a woman and the potential genotypes of their offspring.**

	RP	R*p*	rP	r*p*
RP	RRPP	RRP*p*	RrPP	RrP*p*
R*p*	RRP*p*	RR*pp*	RrP*p*	R*rpp*
rP	RrPP	RrP*p*	rrPP	rrP*p*
r*p*	RrP*p*	R*rpp*	rrP*p*	rr*pp*

According to the Punnett square above, what is the probability that this cross will produce a child who has the Rh factor and produces skin pigment?

F $\frac{1}{16}$

G $\frac{3}{16}$

H $\frac{9}{16}$

J $\frac{12}{16}$

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Relate changes in the DNA instructions to cause mutations, given diagrams.

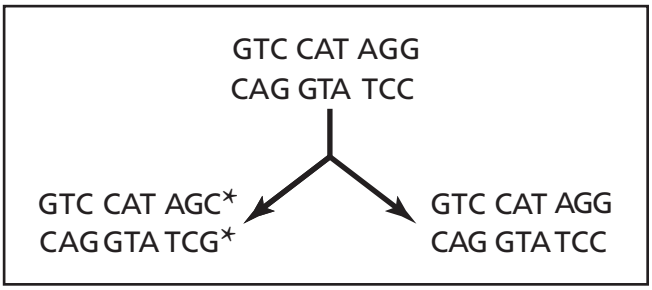
Numbers 49 through 51

Directions

Use the information below to answer Numbers 49 and 50.

Before a cell divides, it makes copies of its DNA. In the diagram, a small segment of DNA from a gene is shown before and after a copy is made. In the copied segment of DNA an error was produced, as indicated by the * in the diagram.

DNA Copies



49 **What is the error indicated by the * called?**

- **A** a translation
- **B** a mutation
- **C** a replication
- **D** a recombination

50 **The error indicated by the * will most likely affect the cell it occurs in by changing**

- **F** the size of the cell
- **G** the cell into a new type of cell
- **H** the fatty acid in a lipid
- **J** the amino acid in a protein

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Relate changes in the DNA instructions to cause mutations, given diagrams.

Numbers 49 through 51

51 **Which of these would most likely result if the wrong sequence of bases were inserted in a DNA strand during replication?**

A mutation
B speciation
C translation
D recombination

Performance Indicator: Recognize the two major functions of DNA as replication and protein synthesis, given diagrams showing a strand of bases with a complementary strand.

Numbers 52 and 53

52 **Which cellular process leads directly to the expression of most genes?**

F genetic mutation
G DNA replication
H protein synthesis
J anaerobic respiration

Reporting Category: 7. Biotechnology/DNA

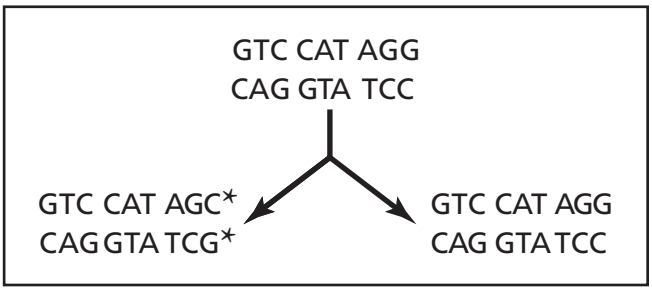
Performance Indicator: Recognize the two major functions of DNA as replication and protein synthesis, given diagrams showing a strand of bases with a complementary strand.

Numbers 52 and 53

Directions Use the information below to answer Number 53.

Before a cell divides, it makes copies of its DNA. In the diagram, a small segment of DNA from a gene is shown before and after a copy is made. In the copied segment of DNA an error was produced, as indicated by the * in the diagram.

DNA Copies



53 By what process does a cell copy its DNA before it divides?

A replication
B active transport
C germination
D anaerobic respiration

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Analyze a series of DNA bases to determine the sequence which demonstrates a mutation.

Numbers 54 and 55

54 **The base sequence of a section of DNA is shown below.**

ATG AAA CGC ATT

Which of the following sequences shows the strand after a point mutation has occurred?

F TAC TTT GCG TAA
G UAC UUU GCG UAA
H AUG AAA CGC AUU
J ATG ATA CGC ATT

55 **A scientist is studying the following sequence in a section of DNA.**

TACGGCCATGAA

If the DNA sequence undergoes a deletion mutation, which of these sequences will most likely result?

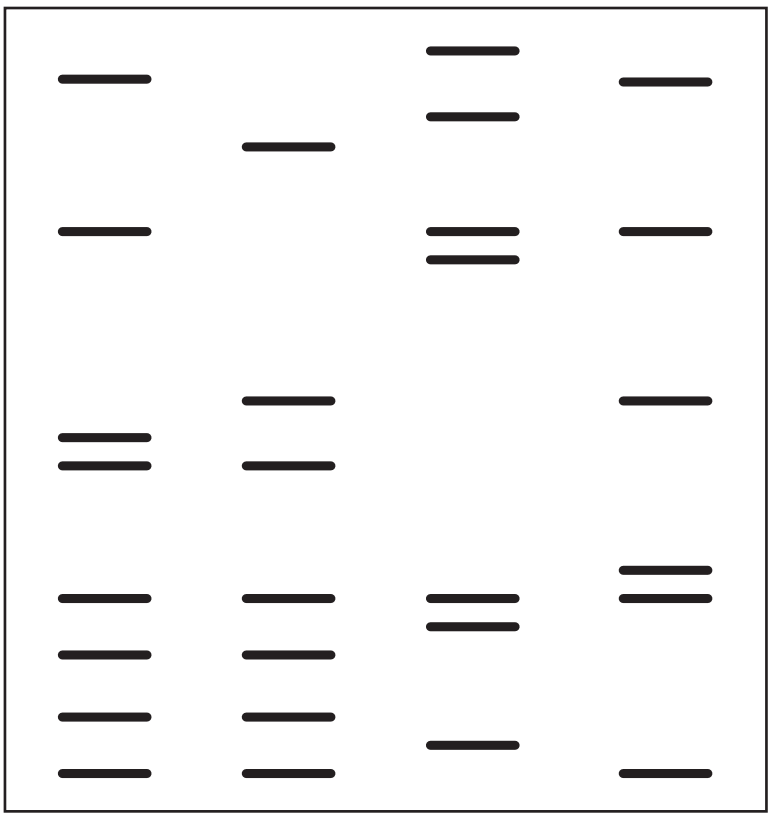
A TAGGCCATGAA
B ATGCCGGTACTT
C TACGGGCATGAA
D TACCGGCCATGAA

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Describe and analyze DNA fingerprinting using an illustration of DNA bands.

Number 56

56 The diagram below shows DNA fingerprints from four different individuals.



Which two individuals are most closely related?

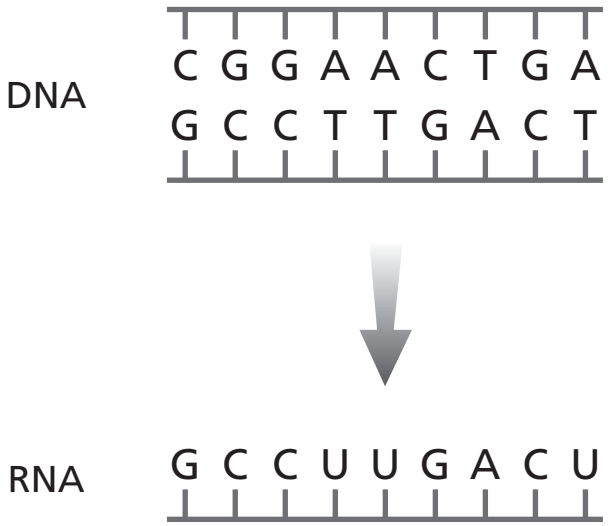
F Individuals 1 and 2
G Individuals 1 and 4
H Individuals 2 and 3
J Individuals 3 and 4

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Differentiate the processes of transcription and translation, given diagrams.

Number 57

57 The diagram below shows a section of DNA that was used to produce a strand of RNA.



What process produced this strand of RNA?

A mitosis
B osmosis
C translation
D transcription

Reporting Category: 7. Biotechnology/DNA

Performance Indicator: Recognize the relatedness of species using DNA strands.

Number 58

58 **A scientist studied a specific strand of DNA from four species of bats. The sequences of the DNA strands are shown in the chart below.**

Species	DNA Sequence
1	TAG CTA ATT
2	TAA CAT ATT
3	TCG CTA ATA
4	TCC CTA TAA

According to the chart, which two species of bats are most closely related?

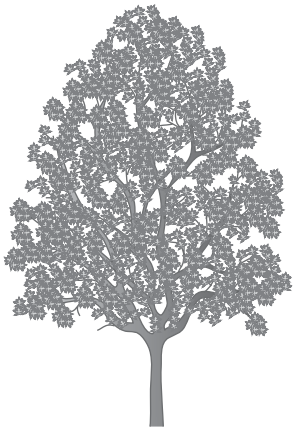
F Species 1 and 2
G Species 1 and 3
H Species 2 and 4
J Species 3 and 4

Reporting Category: 8. Diversity: Biomes and Classification

Performance Indicator: Infer animals or plants indigenous to an environment, given pictures or diagrams of the organisms and a description of the environment.

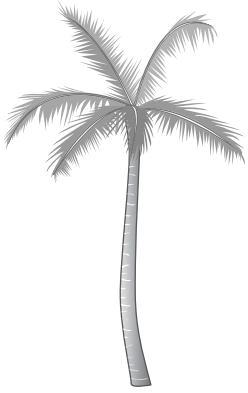
Number 59

59 An environment has cold winters with temperatures often below freezing and hot summers with temperatures often above 75°F. It receives a moderate amount of rain and snow each year. Which of these organisms would most likely live in this environment?



A

C



B

D

Reporting Category: 8. Diversity: Biomes and Classification

Performance Indicator: Infer the biome in which an animal or plant lives, given a description of the organism and pictures of various biomes.

Number 60

60 A particular animal has a heavy coat of fur and a thick layer of fat on its body. The animal also has footpads protected by a dense covering of fur.

In which of these biomes would this animal most likely live?

F

H

G

J

Reporting Category: 8. Diversity: Biomes and Classification

Performance Indicator: Infer the relatedness of different organisms using the Linnean system of classification, given pictures of a variety of different plants or animals and a key to classification of organisms.

Number 61

61 The chart below shows the classification of four organisms.

				
Organism	1	2	3	4
Common Name	Orange-barred sulphur	Orange-banded protea	Silver-spotted flambeau	Silver-studded blue
Class	Insecta	Insecta	Insecta	Insecta
Order	Lepidoptera	Lepidoptera	Lepidoptera	Lepidoptera
Family	Peridae	Lycaenidae	Nymphalidae	Lycaenidae
Genus	*Phoebis*	*Capys*	*Agraulis*	*Plebejus*

According to the classification chart, which two organisms are most closely related?

A Organisms 1 and 2
B Organisms 1 and 3
C Organisms 2 and 4
D Organisms 3 and 4

Reporting Category: 8. Diversity: Biomes and Classification

Performance Indicator: Determine the genus and species of an organism, given a dichotomous key containing descriptions of the characteristic of each classification level.

Number 62

Directions Use the diagram and the classification key below to answer Number 62.

Classification Key

1. a. Tail is shorter than ear..... go to 2
   b. Tail is longer than ear..... go to 3

2. a. Back is striped..... *Dicrostonyx groenlandicus*
   b. Back is entirely brownish..... *Synaptomys cooperi*

3. a. Back is striped..... *Citellus lateralis*
   b. Back is entirely grayish..... *Citellus columbianus*

62 According to the classification key, to which genus and species does this mammal belong?

F *Dicrostonyx groenlandicus*

G *Synaptomys cooperi*

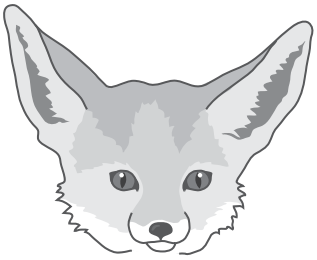
H *Citellus lateralis*

J *Citellus columbianus*

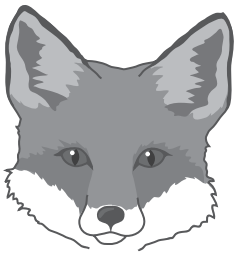
Reporting Category:	**8. Diversity: Biomes and Classification**
Performance Indicator:	**Transfer knowledge of divergent evolution, as in Darwin's finches, to determine why species with a common ancestor have adapted differently, given a diagram of the various species.**

Number 63

63 **The diagram below shows two related fox species.**



Kit Fox



Red Fox

The red fox's reddish coloring allows it to blend into its forest habitat, while the kit fox's beige coloring allows it to blend into its desert environment. The red fox has small ears, while the kit fox has large ears to help rid its body of heat.

Which of the following statements gives the best explanation for the differences between these foxes?

A The foxes developed different adaptations because the kit fox preferred sunnier environments than the red fox.

B The foxes evolved differences in appearance as they adapted to different environments.

C The foxes wanted to evolve differently to prevent competition for the same resources.

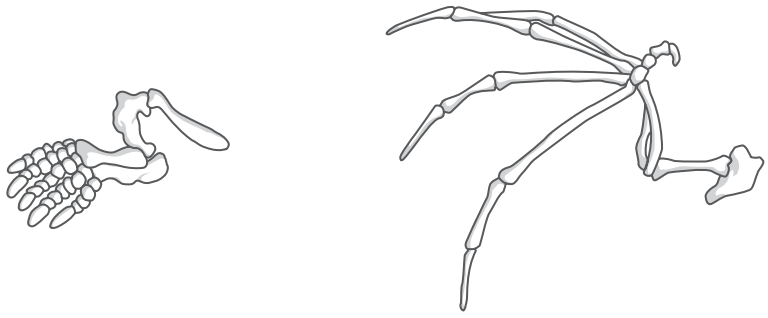
D The foxes evolved differently because their ancestors were trying to avoid overpopulation.

Reporting Category: 8. Diversity: Biomes and Classification

Performance Indicator: Compare homologous structures in species to determine the relatedness of certain species, given diagrams or pictures of each.

Numbers 64 and 65

64 **The diagram below shows two homologous structures.**



These structures are an example of

F genetic variety among individuals in a population

G individuals that have been altered by genetic engineering

H related organisms that have evolved different characteristics

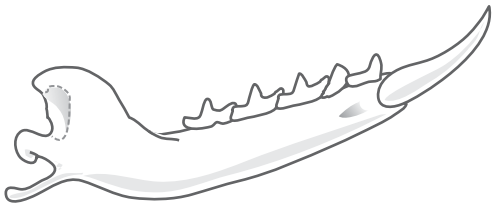
J unrelated organisms that have evolved similar characteristics

Reporting Category: 8. Diversity: Biomes and Classification

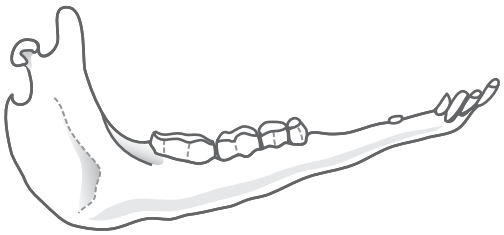
Performance Indicator: Compare homologous structures in species to determine the relatedness of certain species, given diagrams or pictures of each.

Numbers 64 and 65

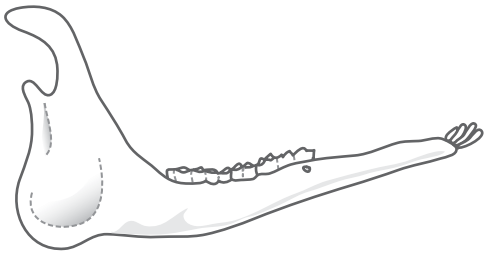
65 **To learn how different species are related, scientists often compare similar structures such as the jaw bones and teeth shown below. These bones are from four different mammals.**



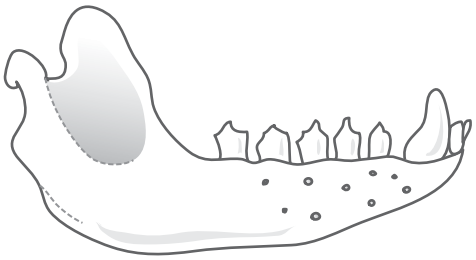
1



3



2



4

Which two mammals are most closely related to each other?

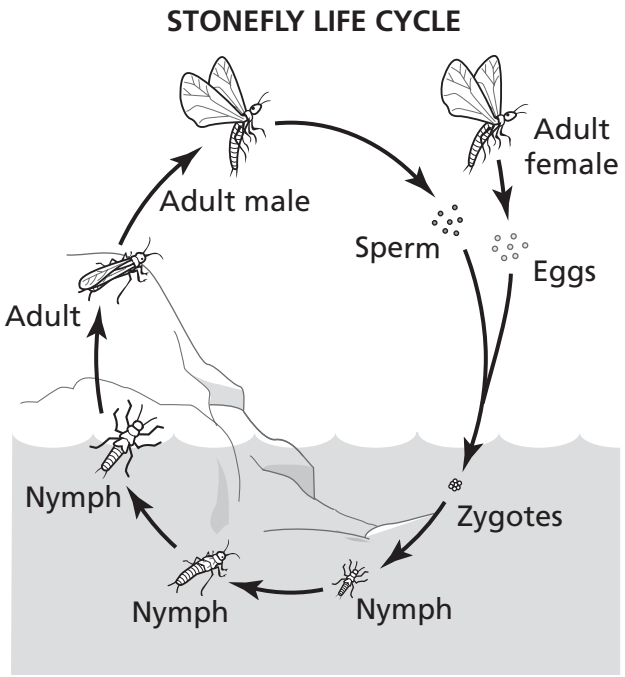
A Mammals 1 and 2
B Mammals 1 and 3
C Mammals 2 and 3
D Mammals 2 and 4

Reporting Category: 9. Diversity: Body Systems and Life Cycles

Performance Indicator: Determine whether an insect undergoes complete or incomplete metamorphosis, given pictures or diagrams of the insect in its stages of development.

Numbers 66 and 67

Directions Use the diagram below to answer Numbers 66 and 67.



66 The life cycle of the stonefly is an example of

F asexual reproduction
G convergent evolution
H complete metamorphosis
J incomplete metamorphosis

67 Why is the metamorphosis of the stonefly considered incomplete?

A Only part of the life cycle is in water.
B It requires both a male and a female stonefly.
C There are only three nymph stages before it becomes a winged adult.
D There is no pupa stage between the immature stonefly and the winged adult.

Reporting Category: 9. Diversity: Body Systems and Life Cycles

Performance Indicator: Infer the body symmetry of an organism, given a diagram or picture of the organism.

Number 68

68 **The diagram below shows a horned toad lizard.**

Which term best describes the body plan of the horned toad lizard?

F asymmetry
G radial symmetry
H spherical symmetry
J bilateral symmetry

Reporting Category: 9. Diversity: Body Systems and Life Cycles

Performance Indicator: Predict the function of a system or organ, given structural descriptions, whether in the earthworm, crayfish, frog, or human.

Number 69

69 **A particular body system contains a network of hollow, elongated vessels. Scattered along this network of vessels are numerous, small masses. These masses contain specialized cells that recognize and react to foreign substances.**

The primary function of this organ is to

A absorb gases
B digest food particles
C direct nerve impulses
D protect against infection

Performance Indicator: Predict the function of an organ, given a description of its component tissues.

Number 70

70 **The framework for a particular type of human organ is a web-like matrix that contains most of the calcium in the human body. The long central cavities of these organs contain a fatty yellow tissue. The ends of these organs contain a red tissue that produces blood cells.**

What is the main function of this organ?

F to absorb digested food
G to remove waste matter
H to provide support and protection
J to control and coordinate all body parts

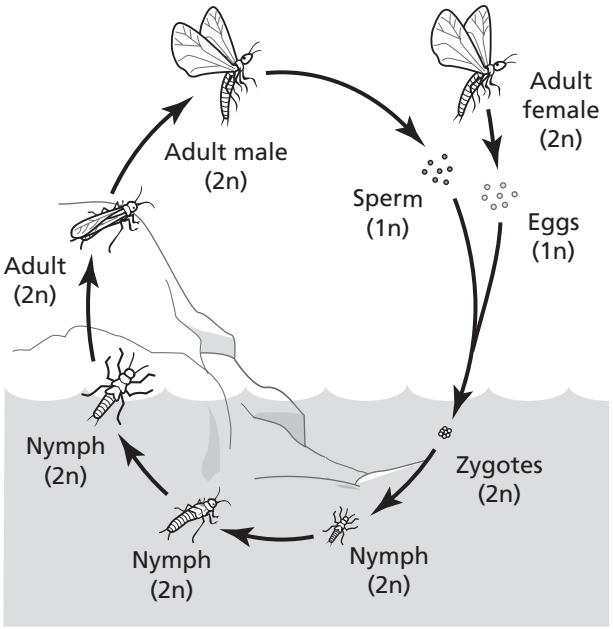
Reporting Category: 9. Diversity: Body Systems and Life Cycles

Performance Indicator: Compare and contrast life cycles of various organisms to include alternation of generations, given pictorial representations.

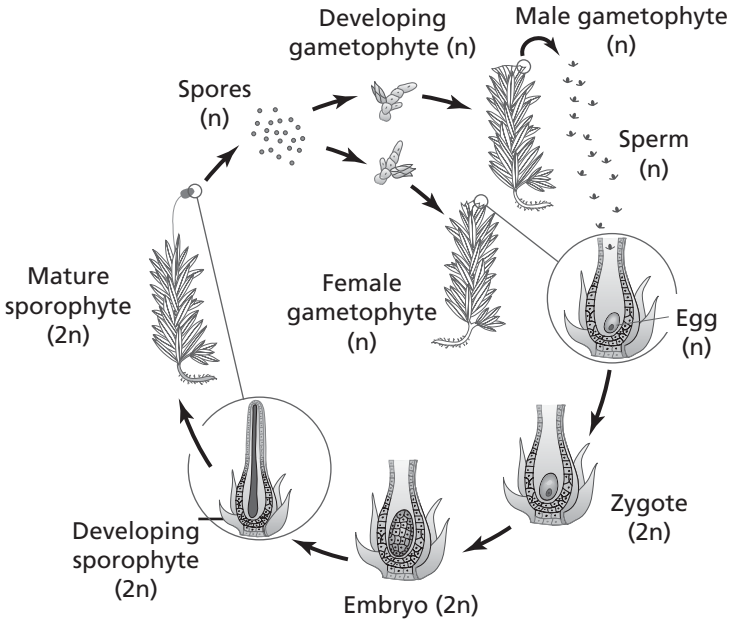
Number 71

71 The life cycles of a stonefly and a moss are shown in the diagram below.

STONEFLY LIFE CYCLE



MOSS LIFE CYCLE



KEY
1n: Cells of organism have one set of each chromosome.
2n: Cells of organism have two sets of each chromosome.

Which of these occurs during the life cycle of a stonefly but not a moss?

A mitosis
B pollination
C alternation of generations
D incomplete metamorphosis

Answer Key for the Gateway Science Item Sampler

Item Number	Correct Answer
1	B
2	G
3	A
4	J
5	D
6	H
7	B
8	F
9	A
10	G
11	C
12	G
13	D
14	F
15	A
16	F
17	D
18	G
19	B
20	F
21	B
22	H

Item Number	Correct Answer
23	A
24	H
25	D
26	G
27	C
28	H
29	A
30	H
31	D
32	F
33	C
34	J
35	C
36	H
37	D
38	F
39	D
40	H
41	C
42	G
43	C
44	H

Item Number	Correct Answer
45	B
46	H
47	A
48	H
49	B
50	J
51	A
52	H
53	A
54	J
55	A
56	F
57	D
58	G
59	A
60	J
61	C
62	H
63	B
64	H
65	C
66	J

Item Number	Correct Answer
67	D
68	J
69	D
70	H
71	D